tion of ptomaïnes. Thus, in the case of the pus-forming organisms, it has been shown that they can much more readily attack the living tissues when the latter are inflamed; and it has also been shown that the ptomaïnes, some of them at least, do thus prepare the tissues for the microbes by exciting inflammation. In a broad area of suppuration the ptomaïnes diffuse into the tissues out beyond the sphere of direct bacterial action, and the organisms follow closely in the wake of the inflammatory area thus formed. This was observed to be the course of events, in the keratitis excited by Leber with cadaverine.

Typhoid, cholera, and many other organisms, are destroyed when injected directly into the blood; but in later stages of these, as of most infectious diseases, the organisms are found often in large numbers in the circulating fluid. It is very possible that the changes in the blood which permit of the growth of the organisms are due in part to the action of ptomaïnes on the blood itself; but it is also probable that they are due to changes in general nutrition, affecting the organs by means of which the blood is formed. This, however, is a branch of the subject on which we have only just begun to speculate, and on which little work has been done.

On the other hand, we have considerable positive knowledge in regard to an opposite action of ptomaïnes; namely, the rendering of tissues refractory to the action of microbes. It has long been known that the growth of micro-organisms in artificial culture-media, in very many instances, soon produces such changes that the media are no longer capable of supporting baterial life. Various explanations have been offered of this phenomenon; but it is now definitely settled, particularly by the experiments of Garré and Freudenreich, that it is in most instances due to the production of substances which exert a hostile influence upon the vegetation of the organisms. This explanation is of very great importance, both practical and theoretical, in relation to immunity, particularly acquired immunity, in animals. Various theories have from time to time been advanced to account for this phenomenon.

1. The theory was advanced by Pasteur and Klebs that the immunity was due to the consumption by the organisms of certain ingredients of the tissues which were necessary for the growth of the organisms, and which were not afterwards replaced. This "exhaustion hypothesis" has now been generally abandoned as not in accord with observed facts.

2. The theory of Metchnikoff is, that the invading organisms are devoured by the leucocytes, which, by this exercise of their functions, acquire an increased power in this direction which can be effectually exercised on a subsequent occasion.

3. Lastly, it has been suspected, that, during the first attack of an infectious disease, soluble substances are elaborated which exert such a physiological action on the tissues that the latter are enabled to resist the inroads of the organisms; and that this refractory condition remains a longer or shorter time, until it is lost through the regular metabolic changes of the animal body. This is the "retention hypothesis," and is favored by most of the evidence which has been accumulating during the last few years.

The immunity which is thus produced has varying degrees of permanency. In malarial and relapsing fevers where there is a distinct remission, it is probable that the organisms produce a substance which is a poison to themselves as well as their host, and that its presence in the blood destroys or drives out the organisms in that fluid, while those that are in the spleen and other lymphatic glands remain unaffected. This constitutes the remission, which only lasts a short time, until the objectionable substances disappear or until the corpuscular elements which have been made refractory have been replaced by others newly formed. In such instances the refractory condition is very brief. In other cases, as in anthrax, studied by Roux and Chamberland, or the experimental cholera of Löwenthal, the immunity may last a few days or weeks. In still other cases it may continue indefinitely, as in measles and smallpox.

The success of so many experimenters in obtaining immunity in animals by the administration of chemical substances opens up the most hopeful field of therapeutic research.

Much was expected from prophylactic inoculations with attenuated but living virus; but the difficulty of keeping the virus of the proper degree of virulence, and the danger that arises from the fact that every inoculation establishes a focus from which the disease may spread in severe form, have prevented these expectations from being fully realized. But if immunity can be secured by the use of chemical substances, the action of which can be measured and regulated, and which can be prepared outside of the body, we shall obtain an invaluable means of controlling the infectious diseases.

Every experiment which throws any light on this important subject is worthy of close attention, and, if verified, is a step towards the solution of the great problem of the prevention of disease.

RUSSIAN LITERATURE.

IN *The Publishers' Weekly* for Oct. 12 is printed a statistical report, compiled from official sources, of the number of books published and printed in the Russian Empire (excepting Finland) during 1888. The number of titles recorded amounted to 7,427; the total number of copies printed, 21,103,272. Of these, 5,318 books were in the Russian language, 716 in Polish, 343 in Hebrew, 311 in German, 217 in Lettic, and 178 in Esthonian. The following is a classified list, in tabulated form, showing the number of titles and the editions printed of books in the Russian language: —

	Works.	Copies printed.
Works of reference	629	3,877,092
Educational:		
Religious	521	3.691,838
General	720	3,334,182
General	848	1,953,818
Medical	445	446,985
History	256	288,023
Jurisprudence	176	248,206
Agriculture	173	214,819
Military science	159	211,944
Literature	155	178,623
Juveniles	150	545,662
Geography and travels	144	141,062
Popular literature	142	821,800
Political economy	115	65,341
Technology	101	84,088
Natural history	93	109,240
Pedagogics	60	64,818
Art	52	43,417
Philosophy	46	62,960
Mathematics	45	32,150
Mathematics	43	34,417
Politics, etc	33	31,070
Miscellaneous	312	913,495
	5,318	17,395,050

Among the books of reference there are catalogued 155 Russian almanacs, of which 1,537,649 copies were printed. Besides these, there were also 205 almanacs in other than the Russian language. St. Petersburg and Moscow, of course, lead in the production of literature. Then follow Warsaw, Odessa, Riga, Kasan, Kiew, Tiflis, Wilna, Dorpat, Charkow, Reval, Mitau, etc. The total number of periodicals was 667, of which 493 were printed in the Russian language, 76 in Polish, 49 in German, 13 in Esthonian, 8 in Lettic, 7 in French, etc. The most of these are printed in St. Petersburg. The statistics showing the proportion of inhabitants to the daily journals issued are most remarkable. It appears, that, taking European and Asiatic Russia together, there is but one journal to 484,590 inhabitants. The proportions taken in the cities, for instance, show, in Reval, one daily journal to 8,550 inhabitants; in Riga, one to 13,490; in Tiflis, one to 14,860; in St. Petersburg, one to 28,970; and in Moscow, one to 75,350. This gives one a tolerably clear idea of the intellectual development of the masses.

M. Pawlenkow gives the following facts concerning the prices some of the prominent Russian authors realized for their work. Shortly before his death, Turguenieff sold the rights in all his published works, "for all time," to Glasunow, for 90,000 rubles (over $69,300). The publishing-house of Ssalajewy offered to the novelist Shtshedrin for his writings 60,000 rubles, but the transaction was not consummated. Gogol received 60,000 rubles; Pushkin, 35,000 rubles; Schukowskij, 5,000 rubles; Krylow (for his fables), 14,000 rubles; Nekrassow, 15,000 rubles; Gontsharow, 35,000 rubles; Ostrowskij, 10,000 rubles (for one edition); Grigorowitsh, 5,000 rubles; Aksakow, 3,000 rubles (for one edition); Mey, 1,000 rubles. The popular author, Gleb Uspenskij, sold his works to Pawlenkow and Ssibirjakow for 25,000 rubles. Pawlenkow printed

a cheap edition of these books, and sold 10,000 copies within one year. Popular text-books seem to have the largest sales; and Polubojarinow, the publisher, paid to the author of a series of arithmetics, Mr. Jewtushewskij, the sum of 50,000 rubles. From the foregoing it will appear that the notion that Russian literature is made up solely or largely of those writers whose works have thus far been translated into English — Turguenieff, Tolstoï, Dostoyevsky, and Gogol — is fallacious. As a writer in the *Christian Union* recently pointed out, it would be as just to England and America to translate Dickens, Hawthorne, and Haggard into some foreign tongue, and represent them as English literature, as it is to Russian literature to be judged by the writings of the authors now known to us through English translations. "Nothing could be more unfounded or contrary to the fact than the impression which is abroad that we have in these translations a fair presentment of Russian literature. In reality, we who only read English — and even those of us who know French and German — have gained no more of that literature than the faintest glimpse. With very few exceptions, the books that have been Englished are all novels: they are all novels of the modern period, but they do not do the smallest justice to the novelists of that period. We rave about Turguenieff and Tolstoï, but what of Gontcharov, Pisemsky, and Pomyalóvsky, and half a dozen others equally or unequally noteworthy, about whom never a word is said? And then what have the Russian poets, the Russian essayists, the Russian historians, the Russian scientists, done, that we should be kept in the most Cimmerian darkness as to them and their works? By what strange caprice of translator or publisher or public is it that to Anglo-Saxon readers Pushkin, Lérmontov, Griboyédov, Kylov, Bielínsky, Káramsin, Bestyuzhev-Ryúmin, Solóviev, Písarev, Dobrolyúbov, and so many others, remain practically unknown? All the more is there reason to wonder at and deplore this neglect when it is remembered that in ignoring writers like these we are taking special pains, as it were, to hold unliquidated our manifest duty to a great race."

ELECTRICAL NEWS.

NEW INSULATING MATERIAL. — A recent German patent for a new insulating material for electric conductors specifies the use of paper which has been thoroughly soaked in an ammoniacal copper solution. The pasty mass is then pressed against the conducting wires to be covered by means of rollers, and the whole is finally submitted to strong pressure. When dry, the covered wire is passed through a bath of boiling linseed-oil, being left in it until the covering is saturated. This makes it elastic and impermeable to moisture. The covering is said to be durable, and efficient as a non-conductor.

LEAD-COVERED CABLES. — It has been accepted as an acknowledged fact that lead-covered cables, when placed under ground in creosoted wooden troughs, undergo a rapid deterioration of the lead sheathing, owing to the metal being converted into a carbonate; but closer research tends to show that this destruction need not necessarily take place. Close observation of creosoted conduits and lead-covered cables, laid at various times since 1884, apparently prove, according to the London *Electrical Review*, that the destructive agent usually present in freshly creosoted wood disappears almost entirely after a few years. A cable was laid upwards of two years ago in a conduit constructed in 1884, and at this date there is but very slight trace of action on its surface, while part of the same cable laid in an 1888 conduit shows considerable scale of carbonate of lead after one year's exposure. Parts of the same cable placed in other conduits about a year after their construction show but little damage. One cable laid in 1885 is only slightly affected, and it is not anticipated that any further deterioration will take place. Some experiments to test the effect of time and ventilation on creosoted wood were carried out by placing cables covered with an alloy of tin and lead in boxes made of creosoted wood, one box made of wood creosoted more than two years back, and another more recently impregnated. These boxes were sealed up, and opened after a lapse of three months. The samples in the old wood box were barely touched, while the samples in the newer one were thickly covered on the sides and top with what is chemically known as phenolate. Either phenol, a volatile gas, or acetic acid in combination with carbonic-acid gas, will attack lead and reduce it to a carbonate. If no acetic acid is present in the wood, and the phenol be evaporated by some means or another, there should be no more damage done to lead cables in creosoted troughs than if they were run in conduits of other materials; but means should be taken to freely ventilate the troughs, not only to protect the cables, but also to guard against accumulations of explosive gas. Under these conditions, plain lead sheathing would prove as efficient as that made of the tin alloy, the durability of which latter covering can hardly be accepted as assured.

LIGHTNING ON WAR-VESSELS. — Apart from the modern vessels being protected by their construction, or by special provisions for the purpose, the London *Electrical Review* asserts that lightning does not play as destructive a part as it did forty or fifty years ago, as even those ships unprovided with conductors have suffered less damage than a smaller number of ships experienced formerly; not that modern vessels are exempt, but they seem to be struck in a manner which causes fewer fatal accidents, and in some cases even the effects of a lightning-flash have borne so little trace of their origin that they have been credited to the wilful act of some one on board.

HEALTH MATTERS.

The Pathological Bearings of Heredity.

ANIMALS, including man, have arrived at their present state of development by the combined but rival forces of heredity and evolution, the latter term including the effects of surrounding environment. Evolution without heredity, as Ribot observes, would render every change transitory; and every modification, whether beneficial or not, would disappear with the individual. The results of heredity without evolution, on the other hand, would give us the monotonous conservation of the same types fixed once and for all. With heredity and evolution we have life and variation. Evolution produces physiological and psychological modifications, habit fixes these in the individual, and heredity fixes them in the race. These aphorisms, says *The Medical Press*, apply as well to diseased conditions as to health, and, in endeavoring to unravel the mysterious bearings of heredity upon disease, we have to bear in mind the conflicting influence of stability with this tendency to variation. The operation of hereditary tendencies is perpetually disturbed by innumerable circumstances unappreciable by our means of observation, but capable nevertheless of producing varieties infinite alike in extent and degree.

It is well known that sensitiveness, whether to general or special impressions, varies extremely in different individuals. An operation which involves pain amounting to agony to one person will be borne by another with comparative indifference; and the tissues of one person will re-act to stimuli to such an extent as to cause violent inflammation, while those of another prove quite passive under similar circumstances. It is this varying irritability which explains the fact that no two cases are exactly alike of the same disease. These differences are distinctly transmissible from parent to offspring; and, when the inherited quality is a tendency on the part of certain tissues to re-act more readily than normal to morbid influences, we say that a person has a diathesis. What we term, for the want of a better word, idiosyncrasy, is in reality a diathesis or part of a diathesis, — a peculiar susceptibility of the individual to re-act unduly, either in excess or otherwise, to certain stimuli. Idiosyncrasies may be transmitted, as they very frequently are; but they are in any case congenital. These peculiarities of tissue and function often remain latent until some morbid process emphasizes the fact that a particular proclivity exists in the individual. This point cannot be better illustrated than by quoting the well-known story, that, of several hunters who were thrown at the same time into the same stream of water, no two were affected alike. In one an attack of rheumatism marks the tendency of joint-tissues to take on a certain process of inflammation, in another an attack of inflammation of the lungs points out the pulmonary apparatus as the organ least endowed with powers of resistance, while a third